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REVIEW ARTICLE

Viral and bacterial diseases in livestock in Mongolia

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Abstract

This review focuses on the status of infectious diseases that are serious for animal health and have adverse economic effects in Mongolia. Data presented here are limited due to the lack of published or other easily available documents. Foot-and-mouth disease continues to cause substantial economic losses as exemplified by the outbreak of infection with serotype O PanAsia lineage virus. In the case of the 2001 outbreak, a 65% reduction in export revenues was recorded. In order to ascertain the free status of Mongolia from rinderpest, sero-epidemiological surveillance has been carried out since 2001.

In 2004, Mongolia was certified free from rinderpest by Office International des Epizooties (OIE). A sharp rise in both animal and human brucellosis incidence has become a serious problem. Rabies and anthrax remain endemic with occasional human cases. Other prevailing infectious diseases are contagious pustular dermatitis, contagious agalactia, enterotoxemia and pasteurellosis. The current programs for the control of infectious diseases in livestock in Mongolia lack a definite policy that would enable rapid implementation. A large-scale surveillance of infectious diseases in animals and management of appropriate preventive measures are urgently required in Mongolia.

Key words : Infections, Livestock, Mongolia, Surveillance

Introduction

Mongolia is located in central Asia and covers an area of 1.565 million sq. km. The 21 provinces of Mongolia and the neighboring countries are shown in Fig. 1. Provinces are subdivided into counties. Pastoral animal husbandry, extremely dependent on climatic and environmental conditions, has been a traditional lifestyle and a major sector of the national economy of Mongolia. Eighteen percent of the total population of 2.4 million in Mon-

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Figure 1. Map of Mongolia showing 21 provinces: Dornod (1), Sukhbaatar (2), Khentii (3), Dornogovi (4), Govisumber (5), Tuv (6), Dundgovi (7), Selenge (8), Darkhan-Uul (9), Umnugovi (10), Bulgan (11), Orkhon (12), Uvurkhangai (13), Arkhangai (14), Khuvsgul (15), Bayankhongor (16), Zavkhan (17), Govi-Altai (18), Uvs (19), Khovd (20), Bayan-Ulgii (21). Ulaanbaatar, the capital city (★). Provinces are numbered for the Table1.

golia are herders[13]. The livestock sector comprises of approximately 13.6 million sheep, 10.0 million goats, 2.4million horses, 2.3million cattle and317.4thousand camels (Ministry for Food and Agriculture of Mongolia, 2001). Intensive poultry and pig farming are rare. About 10 intensive farms are keeping approximately 70, 000 chickens[23]. The total number of pigs is around 19, 000 (Tserendorj, Sh., personal communication). Interactions of infectious and non-infectious diseases of livestock, availability of feeds and water resources are important factors that determine human settlement and livestock grazing patterns. Co-existence of wildlife and livestock populations provides conditions that are favorable for the transmission of viral, bacterial and parasitic disease agents.

Epidemiological data of animal infectious diseases in Mongolia are mainly in Mongolian or available only through personal communications and they have hardly been published in international peer-reviewed journals, which is an impediment to the would-be researchers. This review, thus, focuses on the status of the diseases that are serious for animal health and their adverse effects on the economy of the livestock industry in Mongolia. It is hoped that information provided here will provoke further research activities that may lead to the development and implementation of appropriate and efficient disease control measures. The infectious diseases in livestock are divided into groups of viral and bacterial diseases.

Viral diseases

Foot and mouth disease (FMD)

FMD outbreaks occurred in Mongolia in 1928-1929 and 1941-1944. In 1963-1973, outbreaks that lasted for the longest period were caused by serotypes O and A[17].

Table 1. Serious viral and bacterial diseases in livestock in Mongolia

Disease	Animal species**	Distribution*	Control or intervention***
Viral diseases			
Foot-and-mouth disease	bov, cap, ovi, cml	(1-4, 6, 8, 12, 20-21)	Cr, Qf, Qi, Sp, Su, V
Rabies	bov, cml, ovi, equ, cap	(1-21)	Qi, Sp, Su, V
Equine influenza	equ	(1-21)	Z, Qi, V
Equine infectious anemia	equ	(6, 8-9, 11-12, 15)	Cn, Sp, Qf, Qi, Su
Contagious pustular dermatitis	cap, ovi,cml	(1-21)	Qi, Su, V
Bacterial diseases			
Brucellosis	bov, cap, cml, ovi	(1-21)	Cn, Sp, V
Anthrax	bov, ovi, cap, equ, cml	(1-3, 6, 8-9, 11-17, 19-20)	Cn, Qi, Su, V
Contagious agalactia	cap, ovi	(6-21)	Cn, Qi, Su, V
Salmonellosis	ovi, cap	(1-15, 17-21)	Su, V
Glanders	equ	(2, 4, 9, 14, 17)	Qf, Qi, Su
Leptospirosis	bov, equ, cml, ovi	(1, 4-6, 8-10, 14-15, 18-19)	
Tuberculosis	bov, yak	NA	Qi, Su, Te
Enterotoxemia	ovi, cap	(1-21)	V
Pasteurellosis	bov, ovi, equ, yak	(1-6, 8-9, 11-21)	Cn, V
Strangles	equ	(1-21)	Qi, Su, V
Blackleg	bov	(1-21)	Cn, V
Listeriosis	cap, ovi, bov	(2-5, 7, 11-12, 14-15, 17-18, 20)	Cn, Cr, Qi, V

* Data were obtained from the references in the text and reports of incidences of infectious diseases in livestock (State Veterinary Department, Mongolia, 2002-2003). The numbers denote the provinces as shown in Fig. 1.
** bovine(bov), caprine(cap), ovine(ovi), camelidae(cml), equidae(equ), information not available(NA)
*** control of arthropods (Cn), control of wildlife reservoirs (Cr), movement control inside the country (Qi), precautions at the border (Qf), modified stamping out (Sp), surveillance (Su), screening (Te), vaccination (V), zoning (Z)

The World Reference Laboratory identified a serotype O PanAsia lineage virus as the causative agent of the outbreaks starting in late 1999 and 2000, in a number of countries[12]. This virus lineage had originated in India in 1990 and spread through the Middle East, Turkey, and Eastern Europe moving eastwards into the People's Republic of China in 1999 and then to Taiwan, South Korea, Japan, Mongolia, and far-east Russia[11]. On April 30, 2000 an outbreak of FMD that began on April 15, 2000, in Ulaanbadrakh (county) of Dornogovi Province was reported to OIE[7]. In 2001, FMD was detected in Sukhbaatar, Dornod and Khentii Provinces, eastern part of Mongolia and in the capital city Ulaanbaatar. In the same year, the outbreak spread into neighboring Orkhon and Selenge Provinces. In 2002, FMD outbreaks occurred in Bayan-Ulgii and Khovd, the western provinces. In February, 2004, an outbreak of FMD in Dornogovi was reported. Cattle were mostly affected followed by sheep, goats and camels[15]. In young animals FMD is fatal. Even though it is not usually fatal to adult animals, debilitation causes significant losses of productivity. To abate the detrimental economic consequences of FMD, control measures, which include di-

viding the country into outbreak, buffer, vaccinated healthy, control and healthy zones have been introduced. These measures are aimed at preventing the spread of the disease and facilitating restrictions on the movement of susceptible livestock, fresh meat and animal products, following the OIE control policy recommendations for the affected countries to reacquire FMD-free status and subsequently, participating in international trade. A vaccine, prepared by the All-Russian Research Institute for Animal Health, Vladimir, from virus strains of serotypes A_{22} and O_1 has been used[22]. Epidemiological surveillance of FMD with the support of the Asian Development Bank Project for development of agriculture began in 2003 in Uvs, Khovd, Govi-Altai and Zavkhan and the eastern provinces of Mongolia[5].

Rinderpest

Rinderpest in cattle and yaks were reported officially in 1913 in Mongolia. Since then outbreaks were recorded in 1936, 1938, 1945 and 1948. The last outbreaks that occurred in 1991 - 1992 in Dornod, Uvs and Bayan-Ulgii Provinces, were eradicated rapidly under appropriate control measures[30]. The freeze-dried live vaccine against bovine rinderpest prepared from strain Kabete 'O' by Biocombinat[31] contributed to the eradication of the outbreak[17]. The issues about the suspicion that a reservoir of rinderpest infection still persisted in Mongolia and northern China, needed to be resolved[10]. In order to ascertain the free status of Mongolia from rinderpest, sero-epidemiological surveillance has been carried out since 2001[5]. In 2004, Mongolia was declared free from rinderpest[16] by OIE.

Rabies

Rabies remains an endemic problem, which affects mostly cattle followed by camels, dogs, sheep, horses and goats in Mongolia[15]. Occasional human cases have also been reported[9]. In Mongolia, infections from rabid wild animals, such as corsac fox, fox, manul and wolf, frequently occur. These animals serve as natural reservoirs of rabies[28].

Equine and camel influenza

Equine influenza, which had frequently occurred in Mongolia up to the end of the 1970's was identified to be caused by H7N7 and H3N8 influenza viruses[2]. In the spring of 1993, an equine influenza outbreak occurred in Khovd Province and spread all over the territory of Mongolia. In this outbreak there was a morbidity of 40.6% and mortality of 2.1% of the total of 2.1 million horse population[3], making it the most significant, so far.

Nineteen outbreaks of severe respiratory diseases were recorded in camels between1978 and 1988 in 61 herds in different parts of Mongolia. During the epizootic of 1979 - 1980, approximately 4000 camels exhibited severe symptoms, 375 died, 148 aborted and 270 became extremely exhausted. Between 1980 and 1983 thirteen isolates of H1N1 viruses were obtained from diseased camels. The isolate was almost identical to a H1N1 killed vaccine strain reassortant designated as A/Leningrad /54/1[(A/PR/8/34 (H1N1) - A/Khabarovsk/77 (H1N1)] used at that time in the Mongolian human population. At the same time with the camel epizootic, an outbreak of infection with H1N1 influenza virus occurred among vaccinated Mongolian children. It was suspected that a batch of the vaccine strain was not fully inactivated or that reactivation might have occurred. An infected person, who had contact with camels, finally might have transmitted such a strain to the new species[33].

Equine infectious anaemia (EIA)

EIA was first diagnosed in Khushaat

county of Selenge Province in 1952 and the disease was found to be prevalent in horses along Orkhon and Selenge rivers with suitable environment for vector-borne transmission. Cases in Khuvsgul, Selenge, Bulgan Provinces and northern counties of Tuv Province are still being reported[29]. Sentsui *et al*.[25] found 45 positive sera from 144 samples, collected in the areas where EIA was prevalent in 1999, by serological tests using enzyme-linked immunosorbent assay (ELISA) and agar gel immuno-diffusion test (AGID). Ninety-five horses near the capital city, Ulaanbaatar, were tested and showed negative results. In 2002, a countrywide prevalence rate of EIA was estimated to be 1.7%. EIA was included in the project 'Maliin zarim arkhag khaldvart uvchintei temtsekh' to combat several chronic infectious diseases, scheduled for 2003-2007 by the government of Mongolia[21].

Contagious pustular dermatitis (Orf)

Dashtseren[30] first detected contagious pustular dermatitis caused by parapoxvirus in 1962 in Mongolia. In prevalent herds, around 60% (11.8-81.8%) of lambs and kids were infected from which 25.6% (4.8-39.7%) were fatal cases. In Mongolia, goats are more sensitive than sheep to orf. In 1979, the disease was found among camels in some areas of Mongolia. The morbidity in 2 to 3-month-old camels was between 50-70% reaching 100% in 1-year olds and 10-80% in adults. Vaccination with the material containing camel contagious pustular dermatitis virus was promising. In contrast, camels were not protected after immunization with vaccinia virus and with the vaccine against sheep and goat orf[8].

Bacterial diseases

Brucellosis

Since the early 1960's intensive control programs of brucellosis have been executed in Mongolia with testing rates between 50-60%.

The vaccination program carried out in the 1980's was probably the most successful[18]. In 1966-1968, cattle population infected with brucellosis was recorded as 6.5%, 3.3% in 1971, 1.5% in 1981, and 0.8% in 1991[6]. In 1969, brucellosis in camels was 1.2%, 1% in sheep and 1.8% in goats, whereas it reduced to 0.8%, 0.05%, and 0.1%, respectively, in 1987[28]. In the 1970's, mass vaccination of livestock successfully reduced the annual incidence in humans to less than one case per 10,000[19]. After 1990, under the privatization of the livestock, surveillance of brucellosis has been reduced to 3-5%, a factor that could have led to a sharp rise in the incidence of both human and animal brucellosis[18]. In 2002, average prevalence rates of brucellosis in cattle were 2% and 0.4% in sheep and goats in Mongolia[21]. Batbaatar *et al*.[1] found that incidences of brucellosis in suspected herds were 15.5% and in herds, where abortion cases were prevalent, 39.3% by the Rose-Bengal test. Brucellosis is the second most important infectious disease of both adults and children in Mongolia where up to 30% of nomadic livestock herders, including women and children, are infected[20]. *Brucella melitensis* appears to be the most common species, which is isolated from patients[9]. The current test and slaughter approach has had limited successes due to the low surveillance, and the inability to cull positive animals since there is no existing policy for the compensation of the owners of the affected livestock. A whole-herd vaccination strategy, sponsored by the Mongolian government and World Health Organization (WHO), and to last for 10 years is under-

way[18].

Anthrax

Establishment of veterinary services in this country enabled the control the high prevalence of anthrax. But recently, lack of appropriate vaccination programs, practicing voluntary slaughter of infected animals without state compensation, and inappropriate disinfection of dead animals have led to the increase of the prevalence of anthrax[28]. Between 1989-2002, anthrax cases were reported as follows: 2,135 cattle, 90 sheep and goats, 17 horses and 5 camels[26]. During 1978-1998, Arkhangai, Bayankhongor, Bulgan, Dornod, Zavkhan, Uvurkhangai, Sukhbaatar, Selenge, Tuv, Uvs, Khovd, Khuvsgul and Khentii Provinces and the capital city Ulaanbaatar had cattle and sheep epizooties[28]. Occasional human cases of cutaneous or intestinal anthrax also have been reported[9].

Contagious agalactia

Contagious agalactia is one of the most widespread diseases in Mongolia. Damdinsuren[30] discovered in 1974 that contagious agalactia prevailed in 17 provinces of this country with the death rates of 6.5-8.2% and abortion rates of 18.2%. He also reported that 20.1% of ewes, 0.9% of rams, 9.9% of lambs, 48.6% of does, 0.5% of bucks and 20% of kids were infected. The diseased animals lost up to 10% of their body weight and 62% of milk production.

Salmonellosis

Yondondorj and Baatar[30] isolated 57 highly pathogenic strains from sheep and lambs where 50 were *Salmonella abortus ovis* and six were *Salmonella typhimurium*. In 10 isolates from goats and kids, nine were *Salmonella abortus* ovis. Yondondorj, according to his research in 1977-1987, divided the country into two regions, prevalent and less prevalent. Dundgovi, Bayan-Ulgii, Arkhangai, Dornogovi, Zavkhan, Govi-Altai, Uvurkhangai, Khuvsgul, Uvs and Tuv Provinces were in the prevalent region. The less prevalent region comprised of Bulgan, Dornod, Umnugovi, Selenge, Sukhbaatar, Khovd and Khentii Provinces. He estimated that the loss of diseased animals might have reached around 20%.

Glanders

In Mongolia, up to the 1940's, glanders was one of the most prevalent infectious diseases[29]. In the middle of the 1960's, diagnostic, therapeutic and preventive projects were carried out against glanders, which greatly decreased the disease prevalence[6]. In 2002, a countrywide prevalence rate of glanders was reported to be 0.2%[21]. In Dornogovi, an allergen test detected 118 positive reactors from 9,977 horses and in Darkhan-Uul, 13 of 93 horses were positive by complement fixation test (CFT) in 2002. In 2003, 32 from 21,078 horses in Zavkhan, 166 from 19,462 horses in Sukhbaatar were positive by the allergen test, respectively. In the same year, 14 were positive from 66 horses in Arkhangai by CFT (Tserendorj, Sh., personal communication). Glanders was included in the project 'Maliin zarim arkhag khaldvart uvchintei temtsekh' to combat several chronic infectious diseases, scheduled for 2003-2007 by the government of Mongolia[21].

Leptospirosis

Sebek[24] detected a high serological prevalence of leptospirosis in cattle (24.82%) and in horses (7.32%), while only 1.56% of sheep and 0.76% of camels were positive, the goats being negative. From the five provinces studied, Dornod was the most affected followed by Dornogovi, Khuvsgul, Uvs and Govi-Altai. The predominant serovars were Hardjo and

Tarassovi. The recent serological surveillance in cattle population by the author (to be published elsewhere) showed that Dornod Province (eastern) was more affected (82.2%) than the central provinces, Arkhangai (33.3%) and Khuvsgul (23.5%). The causative leptospiral serovar was Hardjo. Odontsetseg *et al*.[14] found that 31%, 16.7% and 2 % of the serum samples were positive in the horse population in Selenge, Tuv and Umnugovi Provinces, respectively. Bratislava was the predominant leptospiral serovar in horses in Mongolia. The second important serovar of *Leptospira* in horses was Hardjo, which was found to be prevalent in the cattle population in this country. Infection with leptospires of serovar Hardjo from cattle to other species may commonly occur. Further surveillance, isolation of local strains, estimation of the affects of infection on human and animal health, and economic losses caused by leptospirosis are needed.

Mycobacterium infections

Mycobacterium bovis infection rates in cattle and yaks in the northern part of Arkhangai, Bulgan, Khuvsgul, Selenge, Tuv, Khentii and Dornod Provinces of Mongolia were 0.6- 0.9% and 1.1-1.5% in imported dairy cattle during 1966-1968. With the help of the successful control measures the infection rates were decreased to 0.01% during the 1970's[28]. In 2002, a countrywide prevalence rate of bovine tuberculosis was estimated to be 0. 1%. Bovine tuberculosis was included in the project 'Maliin zarim arkhag khaldvart uvchintei temtsekh' to combat several chronic infectious diseases, scheduled for 2003-2007 by the government of Mongolia[21].

In the surveillance during 1966-1973, the average prevalence rate of chicken infection with *Mycobacterium avium* was 7.7% in 14 provinces. When 5 % or more of the chickens on a farm were infected with *Mycobacterium*, all chickens were stumped-out and the farms were re-stocked. In every season, the test was repeated for certification of a disease-free status of the new flock. Mongolia was certified free from avian tuberculosis during the 1970's[28].

Mycobacterium paratuberculosis infections are not well studied in Mongolia[30].

Enterotoxemia

Sugarragchaa and Tserev[30] first diagnosed enterotoxemia in Mongolia in 1959. Dashdavaa isolated 30 local strains of D and C types of *Clostridium perfringens*. In his epidemiological surveillance in1962-1968, enterotoxemia outbreaks occurred in57 counties of Khuvsgul, Zavkhan, Bayankhongor and Uvurkhangai Provinces between May and the end of September with mortality rates reaching 52.5% in July. The animals over 2 years were mostly involved, from which 80.6-90.1% were ewes.

Pasteurellosis

In 1989, Lundaa[28] found that epizootic bovine and ovine pasteurellosis with high mortality rates spread to 115 counties of several provinces in the forest steppe and plain steppe regions of Mongolia, such as Arkhangai, Bayankhongor, Bulgan, Uvurkhangai, Tuv, Selenge, Khuvsgul and Khentii Provinces. Equine pasteurellosis was rare. He isolated B type of *Pasteurella multocida* from cattle, and A and B types from sheep. A pasteurellosis epizootic occurred in winter and spring and mostly affected younger animals (83.6%). Yaks and their hybrids were very susceptible to this disease. Twenty to twenty-five percent of the total vaccine volume produced by Biocombinat, a national biologics factory, is dedicated to the production of vaccine against pasteurellosis[32].

Strangles

Bayarsaikhan and Tsevegmid[29] observed in their research in 1972-1995 that strangles was one of the wide spread infectious diseases in Mongolia, except for Govi-Altai, Dornogovi and Umnugovi Provinces. They divided the country into 3 areas of prevalence: Arkhangai, Bulgan, Dundgovi, Uvurkhangai, Tuv, Khuvsgul, Zavkhan and Bayankhongor Provinces had 17-33%, Bayan-Ulgii, Dornod, Sukhbaatar, Uvs, Khovd and Khentii Provinces, 5-17%, Govi-Altai, Dornogovi and Umnugovi Provinces, up to 5%. Debilitation greatly supports the spread of infection. The higher prevalence of this infectious disease among horses in Mongolia is probably due to the nomadic way of husbandry, which greatly depends on the environmental and climatic conditions, and the milking of mares for human consumption.

Blackleg

Even though the prevalence rate has been gradually decreasing, the whole territory of Mongolia is still suffering from blackleg outbreaks with high mortality rate[30]. In 1996-2003, a total of 3,289 cases of bovine blackleg in which 59% were fatal were reported[15].

Listeriosis

Between 1978-1992, listeriosis was recorded in Arkhangai, Bulgan, Govi-Altai, Dornogovi, Dundgovi, Zavkhan, Khovd, Khuvsgul and Khentii Provinces of Mongolia. Sheep and goat listeriosis occurs mostly in the winter and spring seasons[28]. Between 1997-2002, a total of 659 cases were reported from which 553 were ovine and caprine listeriosis. The rest involved bovine species. The mortality rate was approximately 1:2 in sheep and goats and 1:10 in cattle[15].

Discussion

Since the 1950's, national researchers have been working on epidemiological surveillances and development of livestock disease control measures. Several infections such as contagious bovine pleuropneumonia, contagious caprine pleuropneumonia and sheep pox were eradicated under appropriate control measures[27]. In the middle of 1960's, large expeditions were organized to combat glanders, brucellosis and tuberculosis with the help of the former Eastern Bloc satellite countries, and sharply decreased the prevalence of these infections. Since 1990, Mongolia has adopted a new market economic system by disbanding state collectives and privatizing the animal husbandry sector. Under the new system, surveillance is undertaken at only a limited extent, followed by voluntary slaughter of infected animals without state compensation[19]. Diagnoses of most of livestock diseases are based on clinical or postmortem observations. Thus, definite incidence and prevalence rates of the diseases are not known.

During the outbreaks, livestock and their products, in several cases humans are subjected to restriction of movement and zoo sanitary measures are enforced. Vaccination is the most effective means of controlling viral and bacterial infections of livestock in Mongolia. Since 1923, Mongolia has produced national biologics against infections in livestock. Today, the state-owned enterprise 'Biocombinat' is producing over 60 types of biologics for diagnosis, prevention and treatment infectious diseases of animals[4].

Pasture animal husbandry without boundaries greatly provides herd-to-herd and animal-to-animal contact, and also wild life provides conditions that are favorable for transmission of viruses and bacteria. Conse-

quently, it is needed to establish a more appropriate and sustainable disease control policy that would allow country-wide or regional rather than herd disease control programs to be implemented rapidly.

The disease control efforts are complicated by the fact that Mongolia is a landlocked country. During the outbreak of equine influenza at the end of 1992 and at the beginning of 1993 in Khovd, which spread throughout the country, and rinderpest outbreaks in 1991 - 1992 in Dornod, Uvs and Bayan-Ulgii, similar outbreaks were also reported in the neighboring countries. The threat of spread of disease is significant because of high global demand for meat and meat products, extensive international trade and transport of meat and other foods around the world. Therefore, to effectively combat infections multi-regional disease control programs involving the neighboring Russian Federation and People's Republic of China are required. It is imperative in preparing for and then handling outbreaks, to exchange the right data and using it among the countries involved. Because of the speed at which infectious diseases such as FMD can spread, the key to controlling an outbreak is to detect disease at the earliest possible moment, and thereafter to diagnose infected animals as rapidly as possible. Subsequently emergency vaccination would be employed at an early stage in diseases like FMD so as to ensure that it does not result into an epidemic.

One major obstacle hindering efficient disease control measures is the lack of sufficient specialized veterinary personnel especially in rural areas. There are only few laboratories, which are able to diagnose suspected cases of infections in livestock in Mongolia. This has led to the lack of sufficient data for the evaluation of the epidemiological situation of infections in animals. There is a great advantage in being able to diagnose a disease even before clinical signs appear. Thus, to develop simple, specific and sensitive diagnostic kits that could be used by veterinarians in the field should be encouraged.

There is a tendency for most attention being paid to the fatal diseases rather than the milder but economically important ones. Recently, the author found a high serological prevalence of leptospirosis in the cattle population, which is an unfamiliar disease for animal and human doctors in Mongolia. Leptospirosis may play an important role in abortion and weak calving, which is not rare among bovine species in this country and further may affect the people with occupational risks arising from their close contact with animals. Therefore, research on unknown diseases, which may cause silent hazards and economic losses should be extensively studied.

There is a huge potential public health problem in Mongolia where people slaughter privately for human consumption. Free market for animals and their products by private traders is common in this country. The lack of knowledge of private slaughterers and inefficient state compensation for slaughtered animals greatly support the increase of the risks of zoonotic diseases such as brucellosis and anthrax. To develop the public awareness about the appropriate food processing is important where the safety of the origin is unknown. Easy to understand and interesting propaganda using media should be implemented for public training to decrease the disease prevalence.

Outbreaks of highly contagious infectious diseases or unknown animal health status of a country impose a trade and export ban on animal husbandry products, which in turn negatively affect the national economy. In 2001, because of the FMD outbreak, the People's Republic of China, the major trading partner of Mongolia, refused import of animal prod-

ucts. Analysis of the relevant statistics of the 8 months indicate that the export revenues of 2001 decreased by 65%, compared to those of the same period of the previous year, largely due to the ban[13].

To achieve the goals there is a great need for increased government funding for research into animal disease control projects. With proper coordination between government, veterinarians and herdsmen, the problem of infections in livestock in Mongolia should be minimized.

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